Avifauna as Indicators of Habitat Quality in Some Wetlands of Northern Indiana

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Introduction

Wetlands are among the most vulnerable and threatened of natural habitats. Drainage and filling destroy countless acres each year. In Indiana thousands of acres are destroyed each year and it is estimated that over 80% of the state's original wetlands have been lost in the past 100 years (Cable, 1985). Wetlands and their associated plant and water regimes are among the most productive wildlife habitats of all landforms (Odum, 1971; Toburen and Windell, 1977). The wetlands transition between terrestrial and aquatic habitats is unique and biologically rich. This compliment of wetland dependent species includes many vulnerable birds. Five of 6 bird species extirpated from Indiana bred in wetlands and 15 nongame birds proposed for classification as endangered, threatened, or of special concern are wetland dependent.

Wetland habitats are not easily replaced. Weller (1978) suggests that the creation of wetland habitats from previously non-wetland areas generally results in areas with overall reduced species richness. Logically the rare and specialized plants and animals will suffer most. The uniqueness and irreplaceability of wetlands and other wildlife habitats has fostered the need for techniques to evaluate wildlands.

The U.S. Fish and Wildlife Service (FWS) conducted the first comprehensive inventory of wetlands and their importance as wildlife habitat (Shaw and Fredine, 1956). This was followed by other inventories and assessment methods including: "Classification of Wetlands and Deep-Water Habitats of the United States" (Cowardin et al., 1977); The Canadian Wildlife Service Classification System (Peret, 1975); Ecological Planning and Evaluation Procedures (Hickman, 1974); Habitat Evaluation Procedures (U.S. Fish and Wildlife Service, 1976); Environmental Evaluations Using Birds and their Habitats (Graber and Graber, 1976); and A Method for Wetland Functional Assessment (Adamus and Stockwell, 1983).

With the variety of habitat assessment methods available, any new procedure must provide viable improvements or alternatives. Many procedures suffer from such problems as: cumbersomeness, excessive training requirements before implementation, time consumptiveness, and a limited range of application. The method presented here contains the integral features of many sophisticated evaluation procedures, but it circumvents these problems. The key is simplicity. Simplicity is stressed because it avoids the major shortcoming of many methods currently used.

The Procedure

This technique employs the major concepts of Graber and Graber (1976) assess-

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ment method. Like Graber and Graber (1976), birds alone are used as indicators of habitat quality. Birds are used because they are conspicuous and occur in nearly every type of habitat. Graber and Graber (1976) validified the use of birds (or any other single faunal group) to serve as an indicator of general biological richness.

To initiate the evaluation, each habitat type and acreage is determined using aerial photographs, maps, or field measurements. For wetlands, National Wetlands Inventory (NWI) maps prepared using the U.S. Fish and Wildlife Service (FWS) classification system (Cowardin *et al.* 1979) are recommended.

A field survey must be conducted to assess the avifauna composition of each area if this information is not available. Field surveys are best conducted in June or July to reduce the likelihood of encountering migrants and because birds are vocal and more responsive to prerecorded tapes (Cable, 1985). Multiple trips and occasional night observations may enhance the detection of less conspicuous species, but are rarely a necessity. Although a relatively complete species list is required, it is both expedient and acceptable to limit observation time. If more than one area is being assessed there must be consistency in the time spent if the data are to be comparable. Only bird species which are wetland dependent are used in the assessment calculations. Unlike Graber and Graber (1976) this allows the inclusion of species which depend on wetlands but do not nest there.

This method is predominantly qualitative. The diversity of species is the major concern, although numbers of individuals may be useful for comparisons outside the method. Like Graber and Graber (1976) base values are assigned to wetland species based on the state's population of that species, and the relative specificity of the species for that habitat. Species points are assigned as follows: (1) species with a state breeding population of 50,000 or more birds = 10 points; (2) species with 10,000 - 49,999 birds = 20 points; (3) species with 2,500 - 9,999 birds = 40 points; (4) species with 500 - 2,499 birds = 100 points; (5) species with less than 500 nesting birds in the state are in a special category to be considered above and beyond any numerical value, and (6) species found only in a single habitat have their point values doubled. Accidentals with regard to region or habitat type, migrants, and exotics, are excluded from calculations.

Breeding bird population estimates frequently can be made by qualified ornithologists or "birders" familiar with the state or geographic area of consideration. Breeding bird atlases are becoming available in many states and may provide an excellent source for determining breeding bird populations.

The calculations necessary for completing the habitat analysis are listed below. It may be helpful to refer to Tables 1 and 2 in the following Method in Practice section. 1) Determine the acreages of areas being assessed. 2) For each area, list the wetland dependent species observed. 3) Next to each species, list that species specific point value using three columns (one column for species utilizing a base value only; another column for species restricted to that habitat type and receiving a doubled point value; and the last column for special species, which are not assigned a point value). 4) Add the individual species points to determine the total species points for each area. 5) Calculate the average species index by dividing the total species points by the number of species. This reflects the quality of habitat with regard to species composition. Areas with a greater ratio of rare to common species or a greater ratio of stenoecious to euryecious species will have a higher average species index. 6) The final calculation yields the faunal index, obtained by dividing the total species points for each area by the common log of the acres of each habitat. (Never use a divider smaller than the common log of 20 acres (1.30103), regardless of how small the acreage is, because it disproportionately increases the derived value.) The wetlands can now be ranked using the calculated faunal index values, with the higher index values representing

wetlands of higher quality. After this is completed, the presence or absence of special species, those with state populations of less than 500 individuals, should be considered. Although they do not add to the point value of an area they will usually be a major consideration of the assessment. The faunal index is an indicator of habitat quality because it reflects not only the number of species present but the relative importance of the species composition with regard to rarity, and it expresses this value with reference to acreage. For example, an area with 3 restricted species totalling 60 points would have a greater faunal index than an area equal in size with 6 species totalling 60 points. If species numbers and point values are equal, an area with less acreage would have a higher faunal index because the species points per unit acreage would be greater.

The Method in Practice

Eight northern Indiana wetlands were assessed using our assessment technique, including: Big Chapman Lake, Little Chapman Lake, Heron Lake, Pisqah Marsh, Snake and Greider Lakes, Kiser Lake, Center Lake, and Lake Manitou. Acreages, determined from 7.5 minute U.S. Geological Survey topographic maps ranged from 77 to 436 acres (Table 1). Thirty-two wetland dependent bird species were observed. The largest number of species was seen at Little Chapman Lake.

TABLE 1. Faunal index values derived using this method for selected Indiana wetlands.

Area	Acres	Dependent Species	Special Species	Species Points	Species Index	Common Log of Acres	Faunal Index
Little Chapman Lake	88	23	4	1220	53.0	1.94	627
Pisgah Marsh	153	20	3	1240	62.0	2.18	568
Center Lake	220	22	1	1310	59.5	2.34	559
Lake Manitou	436	22	1	1300	59.1	2.64	493
Kiser Lake	138	20	2	1010	50.5	2.14	472
Heron Lake	130	12	0	640	53.3	2.11	303
Snake & Greider Lake	77	7	0	510	72.9	1.89	270
Big Chapman Lake	157	13	2	490	37.7	2.20	223

Base point values were assigned to each species from population information provided in Mumford and Keller (1984) and from the experiences and knowledge of one of the authors (TTC). Table 2, lists the species observed at each of the wetlands assessed, and the species specific assignment of point values. Total species points ranged from 490 points for Big Chapman Lake to 1310 points for Center Lake, but the average species index was highest for Snake and Greider Lakes and lowest for Big Chapman Lake (Table 2). The faunal index was highest for Little Chapman Lake, followed in decreasing order by Pisqah Marsh, Center Lake, Lake Manitou, Kiser Lake, Heron Lake, Snake and Greider Lakes, and Big Chapman Lake (Table 1).

It should be noted however that there were seen a number of species of special concern. These "red flags" can significantly alter the importance of the wetlands in which they occur. Cable (1985) ranked the same wetlands, in decreasing order of importance, as Lake Manitou, Little Chapman Lake, Pisqah Marsh, Center Lake, Kiser Lake, Big Chapman Lake, Heron Lake, and Snake and Greider Lakes due to the presence of these species of special concern. Specifically, Cable (1985) ranked Lake Manitou as the most valuable because it contained American bitterns. The other areas

TABLE 2. Birds observed in eight Indiana wetlands and their associated species index values.

SPECIES	SPECIES INDEX VALUES BASE	RESTRICTED	SPECIAL	BC	LC	HL	PM	SG	KL	CL	LM
Pied-billed grebe	—	—	x	1	0	0	0	0	0	1	0
Least bittern	—	80	—	0	3	0	9	0	1	1	11
American bittern	—	—	x	0	0	0	0	0	0	0	1
Black-crowned night-heron	—	—	x	0	2	0	1	0	0	0	0
Green-backed heron	20	—	—	0	1	3	19	0	1	16	19
Great blue heron	—	200	—	15	6	1	6	2	13	7	9
Sandhill crane	—	—	x	0	0	0	1	0	0	0	0
Canada goose	—	80	—	0	7	6	0	2	6	3	9
Mallard	—	40	—	8	2	3	8	0	7	10	20
Blue-winged teal	—	80	—	0	7	0	0	0	10	3	12
Ruddy duck	—	—	x	0	1	0	0	0	0	0	0
Wood duck	20	—	—	2	13	2	15	0	8	7	20
King rail	—	—	x	0	1	0	0	0	0	0	0
Virginia rail	—	80	—	2	11	0	22	0	7	3	31
Sora	—	80	—	0	13	6	21	1	7	3	6
Common moorhen	—	200	—	0	0	0	2	0	0	0	1
American coot	—	80	—	0	2	0	0	0	0	4	30
Killdeer	10	—	—	3	0	0	0	0	4	3	0
Spotted sandpiper	—	80	—	0	0	0	0	0	1	2	0
Ring-billed gull	—	—	x	0	0	0	0	0	1	0	0
Northern harrier	—	—	x	1	0	0	0	0	0	0	0
Belted kingfisher	20	—	—	1	1	0	0	0	0	2	1
Willow flycatcher	—	40	—	0	9	0	7	0	5	9	16
Alder flycatcher	—	—	x	0	1	0	1	0	2	0	0
Tree swallow	20	—	—	3	4	1	5	2	14	1	22
Marsh wren	—	80	—	0	23	3	22	3	1	46	20
Sedge wren	—	80	—	0	0	0	2	0	0	0	6
Veery	—	200	—	0	7	0	1	0	0	2	0
Yellow warbler	—	40	—	16	35	3	23	0	7	31	24
Common yellowthroat	10	—	—	7	38	2	11	1	9	24	43
Swamp sparrow	—	40	—	27	28	2	27	3	9	23	61
Red-winged blackbird	10	—	—	51	84	32	74	0	25	62	121

BC = Big Chapman Lake, LC = Little Chapman Lake, HL = Heron Lake, PM = Pisgah Marsh, SG = Snake & Greider Lakes, KL = Kiser Lake, CL = Center Lake, LM = Lake Manitou

were also ranked according to the presence of special concern species. These two assessments are however not incompatible. Instead they provide an example of the systems flexibility for special treatment of those species of greatest importance.

Discussion

The Indiana wetlands example demonstrates the ease of employment of this method. Most assessment techniques require many times more effort to arrive at comparable values. For example, the FHWA wetland assessment method requires mastery of two volumes, over 300 pages of text, before any study can be initiated. It also requires a team of specialists, including a hydrologist, a botanist, a fisheries biologist, and a wildlife biologist visit each site and answer 153 questions. Although this methodology interrelates a much greater diversity of wetland functions, we do not believe that the value derived for wildlife habitat is substantially better than that derived using our method. Specifically, the great number of questions increases the likelihood of mistakes and increases the difficulty in locating mistakes once made. The final value derived using FHWA method ranges from very low to very high values which are rather am-

biguous considering the time, expense, and expertise required to obtain them. Our method, takes considerably less time and yields a numerical value which can be used to rank the areas assessed. The Graber and Graber (1976) method, though not as time or labor intensive as the FHWA method, is nevertheless quite cumbersome because of several calculations that must be made and prerequisite values (such as the percent acreage of a particular habitat in the state) are often difficult to acquire. The method was also designed for Illinois and to adapt it to other areas requires inordinate efforts.

Although the FHWA, the Graber and Graber (1976) method, and other complex techniques are important habitat assessment methods, their cumbersomeness, ambiguity, and extensive time requirements (which all lead to increased costs) limit their applicability. In contrast, our method provides a simple, straight forward, and cost efficient alternative.

Other Applications

Because our assessment method relies totally on the easily observed biology of an area, rather than upon calculations or data manipulations, it can easily be adapted for evaluation of any habitat in which birds are an important community component. If, for example, an oak-hickory forest is to be evaluated, the only modification from the wetland scheme presented is to identify the avifauna dependent on that habitat and use the appropriate species values. The method can be easily adapted to evaluate habitats for a specific interest group. For example, duck habitats can be assessed by including only ducks in the list of species for each habitat and completing the calculation. Habitat for specific target species, or migratory species can also be evaluated.

The flexibility and adaptability of this assessment method requires that the evaluator provide the frame of reference from which the final values are obtained. The habitat assessed, the observed species compliment, and the source of base values must be defined. If these are done, this habitat assessment method both complements previously existing techniques and provides a viable alternative method.

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